Translation of Amended Pages ("Druckexemplar")
of WO 00/05019 (PCT/EP99/05115)

Method and Device for Exchanging Shears in the Cutting to Length of Strips or Sheets in the Rolling or Transport Line

The invention relates to a method for exchanging shears in the cutting to length of strips or sheet metal in a rolling or transport line, in particular, on a rolling table, with blade holders, one being positioned above and one being positioned below the strip, which blade holders are guided by means of holding elements. The invention also relates to a device for performing the method.

Stationary or flying shears are known which can be moved in and out of the rolling line or rolling table but only when the rolling table is not occupied in the area of the shears or other separating device by the strips or sheet metal to be cut.

Shears which are permanently and fixedly arranged in the rolling or transport line are in many cases considered as an obstruction because they cover a portion of the rolling table and thus make a control action in this area more difficult. Also, the shears positioned in the rolling or transport line can present a hindrance to the running of the strip when introducing the leading edge of the strip. However, they may also represent a disturbance factor during further running of the strip, in particular, when inspections or maintenance work has to be performed on the shears or the area of the rolling table covered by the shears. Overall,

with stationarily positioned shears in the area of the rolling or transport line the accessibility of a rolling table area is impaired and, possibly, the running of the strip is disturbed.

From DE 43 36 626 A1 shears for cutting to length are known in strip treatment devices, in which the upper and lower blade holders are arranged in the frame of the shears and at least one blade holder is movable up and down within the frame of the shears. The frame of the shears is of a two-part configuration. The frame parts are clamped to one another. In order to shorten the exchange time for the blade holders, the entire upper part of the frame of the shears together with the blade of the shears is exchanged as a constructive unit. The shears themselves remain anchored unchanged in the strip transport line.

DE 1 457 899 A describes a cutting device with a stationary frame for longitudinally cutting rolling strips in the rolling line. The cutting tools which are adjustable relative to one another are supported on an inner frame which is movable in the vertical direction in the stationary frame. On the inner frame, moreover, a support roll is arranged which cooperates with a table roll in order to tension the rolling strip for the cutting process. These shears of the prior art also remain permanently in the rolling line and a free run for the rolling strip is provided only when no cutting action is to be carried out.

It is an object of the invention to provide a method and a device for exchanging shears in the cutting to length of strips or sheet metal in the rolling line, in particular, on a rolling table, with blade holders, one positioned above and one positioned below the

strip, wherein the blade holders are guided by means of holding elements, by which method and device the aforementioned disadvantages and difficulties can be advantageously overcome.

In a method of the aforementioned kind the object is solved with the characterizing features of claim 1.

Accordingly, while the strip or sheet metal is positioned in the rolling or transport line, the shears together with the blade holders and with their holding elements are moved after each cut out of the rolling line to the side into a neutral waiting position and, before moving out the shears, the forward connection between the blade holders or between the holding elements overlapping the rolling line is opened. For a subsequent cut, the shears are moved into the rolling line so as to overlap it in a U-shaped fashion, and the forward connection of the shears is closed and positively and non-positively coupled by using a clamping element before the subsequent cut. When moving the shears into the rolling or transport line, a part of the rolling table is moved out of the rolling or transport line to the side. Simultaneously to moving the shears out of the rolling or transport line into the waiting position, the moved-out part of the rolling table is again moved into the rolling table.

The method according to the invention provides in an advantageous manner the possibility to arrange the shears between the roll stand and the winding hasp, wherein the shears can be moved for the cutting action across the strip and can subsequently be removed. The shears can be pushed with the open side across the strip. Subsequently, the open side, after it has reached a position

external to the strip width, can be positively connected for the purpose of receiving the shearing forces.

When the leading edge of the strip passes through, the shears are not in the transport line and can therefore not interrupt the running of the strip. Instead of the shears, a rolling table part, moveable in and out, is positioned in the line.

The open shears are moved only directly before the cut into the line. Otherwise, the rolling table remains open in the upward direction and, despite the arrangement of the shears, is still freely accessible.

A device for exchanging shears in the cutting to length of strips or sheet metal in the rolling or transport line, in particular, on a rolling table, for performing the method according to the invention proposes that the shears, inclusive of their drive apparatus, are arranged on a rail-guided driving carriage which is movable by means of a drive transverse to the rolling or transport line when the strip or sheet metal is positioned in the rolling or transport line. The shears comprise a U-shaped frame open toward the rolling or transport line and closed at the drive side, on which frame holding elements with bearings for the blade holders arranged thereat are provided at the drive side as well as the rolling table side. The drive carriage can be coupled with a movable part of the rolling table.

As a result of the U-shaped open configuration, the shears can be moved without problems into the rolling line so as to overlap the rolling table. When moving the shears in or out, the upper blade

holder and the lower blade holder of the shears are positioned so as to freely project above and below the strip or the sheet metal, respectively.

Further advantageous embodiments of the invention are provided according to the dependent claims.

Details, features, and advantages of the invention result from the subsequent explanation of an embodiment schematically illustrated in the drawings. It is shown in:

Fig. 1 in a side view toward the rolling line shears embodied according to the invention on a rail-guided driving carriage with coupled moveable part of the rolling table;

(followed by page 4)

List of Reference Numerals

1	strip/sheet metal
2, 2'	rolling table
3	shears
4, 4'	blade holder
5, 5'	holding element
6, 6'	holding element
7	clamping element
8	drive apparatus
8'	gear
9	drive carriage
10	drive
11	force means
12	synchronization gear
13, 13'	wheel flanges
14, 14'	guide rails
20	machine frame
21	coupling elements
22	upper frame arm
23, 23'	pressure plates
24, 24'	gliding plates
25, 25'	force means
26, 26'	gliding path
27, 27'	recess
28, 28'	coupling sockets
29	lower frame arm
30	force means
31	spindle drive
32, 32'	coupling rod
34	joint

35	pivot axis
36, 36'	force means
38, 38'	gliding plates
39, 39'	recesses

New Claims

1. A method for exchanging shears (3) in the cutting to length of strips (1) or sheet metal in the rolling or transport line (x-x), in particular, on a rolling table (2), with blade holders (4, 4'), one arranged above and one arranged below the strip (1), which blade holders are guided by means of holding elements (5, 5'; 6, 6'), ~~characterized in that~~ wherein the shears (3) can be moved together with the blade holders (4, 4') and with their holding elements (5, 5'; 6, 6') after each cut out of the rolling line (x-x) to the side into a neutral waiting position, while the strip or sheet metal is in the rolling or transport line, and that, before moving out the shears 3, the forward connection between the blade holders (4, 4') or between the holding elements (6, 6') overlapping the rolling line (x-x) is opened, and that the shears (3) for a subsequent cut are moved into the rolling line so as to overlap it in a U-shape, and that the forward connection is closed and, by employing a clamping element (7 or 32), is coupled positively and non-positively before a subsequent cut, wherein, when moving the shears (3) into the rolling or transport line (x-x), a part (2') of the rolling table (2) is moved out of the rolling or transport line (x-x) to the side and, simultaneously with moving the shears (3) out of the rolling or transport line (x-x) into the waiting position, the part (2') of the rolling table is again moved into the rolling table.

2. A device for exchanging shears (3) in the cutting to length of strips (1) or sheet metal in a rolling or transport line, in

particular, on a rolling table (2), for performing the method according to claim 1, ~~characterized in that~~ wherein the shears (3), inclusive of the drive apparatus (8), are arranged on a rail-guided drive carriage (9) which, while the strip or sheet metal is positioned in the rolling or transport line, is movable by means of a drive (10) transverse to the rolling or transport line (x-x), wherein the shears (3) comprise a U-shaped frame (20) open toward the rolling or transport line (x-x) and closed at the drive side, on which, at the drive side as well as the rolling table side, holding elements (5, 5'; 6, 6') are provided having bearings for the blade holders (4, 4') arranged therein, and wherein the drive carriage (9) is coupled with a movable part (2') of the rolling table (2).

3. A device according to claim 2, ~~characterized in that~~ wherein the drive carriage (9) at the rolling table side receives at least one clamping element (7) with actuating members (11, 25, 30, 36).

4. A device according to claim 2, ~~or 3, characterized in that~~ wherein the U-shaped open side of the frame (20) has correlated therewith a clamping element (7) coupling together the holding element (6, 6') at the rolling table side.

5. A device according to ~~one or more of the~~ claims 2 ~~to 4, characterized in that~~ wherein the clamping element (7) is provided with coupling elements (21) for coupling with the holding elements (6, 6') of the frame arms (22, 29).

6. A device according to ~~one or more of the~~ claims 2 ~~to 5, characterized in that~~ wherein the holding element (6) at the free end

of the upper, horizontal frame arm (22) comprises at least one pressure plate (23, 23') and the clamping element (7) has congruent gliding plates (24, 24' and 38, 38') for overlapping them, and that the clamping element (7) is movable by force means (25, 25') on a horizontal gliding path (26, 26') with its gliding plates (24, 24' and 38, 38') across the pressure plates (23, 23' and 37, 37) for generating a positive and non-positive coupling.

7. A device according to ~~one or more of the~~ claim~~s~~ 2 ~~to 6~~, ~~characterized in that~~ wherein the holding element (6) at the free end of the upper horizontal frame arm (22) is provided with threaded spindle coupling rods (32, 32') connected so as to be pivotable to both sides, which, by means of recesses (27, 27' and 39, 39'), are engageable in congruent coupling sockets (28, 28') of the lower frame arm (29) or in the congruent coupling sockets (40, 40') of the upper holding element (6) and adjustable by a force means (30) for generating a positive and non-positive connection with the aid of their spindle drives (31, 31').

8. A device according to ~~one or more of the~~ claim~~s~~ 2 ~~to 7~~, ~~characterized in that~~ wherein the clamping element (7) correlated transversely to the frame arms (22, 29) can be folded upwardly by means of a joint (34) with a pivot axis (35) extending parallel to the rolling line with the aid of at least one force means (36) for coupling of the two frame arms (22, 29) or folded down for releasing the coupling of the frame arms.

Translation of WO 00/05019 (PCT/EP99/05115)

Method and Device for Cutting to Length Strips or Sheets in the Rolling or Transport Line

The invention relates to a method for cutting to length strips or sheet metal in a rolling or transport line, in particular, on a rolling table, by using shears with blade holders, one being positioned above and one being positioned below the strip, which blade holders are guided by means of holding elements.

Stationary or flying shears are known which can be moved in and out of the rolling line or rolling table but only when the rolling table is not occupied in the area of the shears or other separating device by the strips or sheet metal to be cut.

Shears which are permanently and fixedly arranged in the rolling or transport line are in many cases considered as an obstruction because they cover a portion of the rolling table and thus make a control action in this area more difficult. Also, the shears positioned in the rolling or transport line can present a hindrance to the running of the strip when introducing the leading edge of the strip. However, they may also represent a disturbance factor during further running of the strip, in particular, when inspections or maintenance work has to be performed on the shears or the area of the rolling table covered by the shears. Overall, with stationarily positioned shears in the area of the rolling or transport line the accessibility of a rolling table area is impaired and, possibly, the running of the strip is disturbed.

It is an object of the invention to provide a method and a device for cutting to length strips or sheet metal in the rolling line, in particular, on a rolling table, by employing shears with blade holders, one positioned above and one positioned below the strip, wherein the blade holders are guided by means of holding elements by which the aforementioned disadvantages and difficulties can be advantageously overcome.

In a method of the aforementioned kind the object is solved with the characterizing features of claim 1.

Accordingly, while the strip or sheet metal is positioned in the rolling or transport line, the shears together with the blade holders and with their holding elements are moved after each cut out of the rolling line to the side into a neutral waiting position and, before moving out the shears, the forward connection between the blade holders or between the holding elements overlapping the rolling line is opened. For a subsequent cut, the shears are moved into the rolling line so as to overlap it in a U-shaped fashion, and the forward connection of the shears is closed and positively and non-positively coupled by using a clamping element before the subsequent cut.

The method according to the invention provides in an advantageous manner the possibility to arrange the shears between the roll stand and the winding hasp, wherein the shears can be moved for the cutting action across the strip and can subsequently be removed. The shears can be pushed with the open side across the strip. Subsequently, the open side, after it has reached a position

external to the strip width, can be positively connected for the purpose of receiving the shearing forces.

When the leading edge of the strip passes through, the shears are not in the transport line and can therefore not interrupt the running of the strip. Instead of the shears, a rolling table part, moveable in and out, is positioned in the line.

The open shears are moved only directly before the cut into the line. Otherwise, the rolling table remains open in the upward direction and, despite the arrangement of the shears, is still freely accessible.

One embodiment of the invention proposes that, when moving the shears into the rolling or transport line, a part of the rolling table is moved laterally out of the rolling or transport line and, simultaneously to moving the shears out of the rolling or transport line into the waiting position, the moved-out part of the rolling table is again moved into the rolling table.

A device for cutting to length strips or sheet metal in the rolling or transport line, in particular, on a rolling table, by means of shears, for performing the method according to the invention proposes that the shears, inclusive of their drive apparatus, are arranged on a rail-guided driving carriage which is movable by means of a drive transverse to the rolling or transport line when the strip or sheet metal is positioned in the rolling or transport line.

In one embodiment of the invention it is proposed that the shears comprise a U-shaped frame open toward the rolling or transport line and closed at the drive side, on which frame holding elements with bearings for the blade holders arranged thereat are provided at the drive side as well as the rolling table side.

As a result of the U-shaped open configuration, the shears can be moved without problems into the rolling line so as to overlap the rolling table. When moving the shears in or out, the upper blade holder and the lower blade holder of the shears are positioned so as to freely project above and below the strip or the sheet metal, respectively.

Further advantageous embodiments of the invention are provided according to the dependent claims.

Details, features, and advantages of the invention result from the subsequent explanation of an embodiment schematically illustrated in the drawings. It is shown in:

Fig. 1 in a side view toward the rolling line shears embodied according to the invention on a rail-guided driving carriage with coupled moveable part of the rolling table;

Fig. 2 in a side view the upper part of the shears with the clamping element moved out;

Fig. 3 in a front view the shears positioned on the driving carriage with front-side clamping element according to Fig. 2;

Fig. 4 in a front view the shears with coupling rods for the coupling of the machine frame of the shears;

Fig. 5 in a side view the front part of the shears with a foldable clamping element;

Fig. 6 in a front view the shears with the foldable clamping element according to Fig. 5.

The device illustrated in Fig. 1 for cutting to length strips 1 or sheet metal in the rolling line x-x, in particular, on a rolling table 2, shows the shears 3 in a position shortly before performing a cut, with arms 22, 29 of its machine frame 20 still open. The shears 3 have a drive apparatus 8 with reducing gear 8' as well as a synchronization gear 12 flanged onto the frame 20. The shears 3 are moveable, inclusive of its drive apparatus, by means of a drive 10 and a drive carriage 9 guided on rails transverse to the rolling or transport line x-x. The drive carriage 9 is coupled with a movable part 2' of the rolling table 2 and is moved together with the shears 3 such that it is positioned external to the rolling line x-x when the shears 3, as illustrated in Fig. 1, are positioned in the rolling line x-x and, conversely, is rejoined again with the rolling table 2 when the shears 3 are moved out.

As also illustrated in Fig. 1, at the rolling table side at least one clamping element 7 with actuating members 11, 25, 30, 36 is arranged. The actuating members in the present embodiment are hydraulic piston-cylinder units and are referred to as force means. On the rolling table side of the frame arms 22, 29, the holding elements 6, 6' overlapping the rolling line x-x are provided which

receive bearings (not illustrated) for oppositely rotatable rotors of the blade holders 4, 4'.

In the drive side area of the machine frame 20, identical holding elements 5, 5' are provided which also receive the drive side bearings of the blade holders 4, 4'.

The U-shaped open side of the machine frame 20 has correlated therewith the clamping element 7 for coupling the holding elements 6, 6' at the rolling table side. According to the illustration in Figs. 2 and 3, this clamping element 7 is configured for a positive and non-positive connection of the holding elements 6, 6'.

According to Fig. 2 and Fig. 3, a hydraulic force means 11 is provided for lifting the clamping element 7 into the gliding paths 26, 26' or for lifting it out of it. Moreover, the Figs. 2 and 3 show that the holding element 6 has two pressure plates 23, 23' at the free end of the upper, horizontal frame arm 22, that the clamping element 7 has congruent gliding plates 24, 24', that the holding element 6' has two pressure plates 37, 37', and that the clamping element 7 has congruent gliding plates 38, 38'. The clamping element 7 is slidable by force means 25, 25' on a horizontal gliding path 26, 26' with its gliding plates 24, 24' and 38, 38' across the pressure plates 23, 23' and 37, 37' for generating a positive and non-positive coupling.

In Fig. 4 an alternative embodiment of the coupling device between the upper frame arm 22 and the lower frame arm 29 of the machine frame 20 of the shears 3 is illustrated. In this connection, it is provided that the securing element 6 is embodied at the free end of

the upper horizontal frame arm 22 with coupling rods 32, 32' with spindle drive 31, wherein the coupling rods are connected to be pivotal to both sides.

The coupling rods 32, 32' can be engaged via lower recesses 27, 27' and 39, 39' by congruent coupling sockets 28, 28' and 40, 40' of the lower frame arm 29 of the machine frame 20 and are adjustable by a force means 30. The coupling rods 32, 32' are moved with the aid of their spindle drives 31, 31' into the position in which the recesses 39, 39' rests against the coupling sockets 40, 40' for generating a positive and non-positive connection.

In addition, Fig. 4 shows in an illustrative way the configuration of the drive carriage 9 with wheel flanges 13, 13' on the guide rails 14, 14'.

A further alternative configuration of the connection at the open side of the shears 3 is illustrated in Figs. 5 and 6. In this embodiment, the clamping element 7 arranged transversely to the arms 22, 29 of the machine frame 20 is formed with a joint 34 with pivot axis 35 extending parallel to the rolling line. With the aid of the force means 36, 36', the clamping element 7 is folded upwardly for coupling the two frame arms 22, 29 and is folded downwardly for canceling the coupling position. The clamping element 7 which can be folded up or down as well as the coordinated force means 36, 36' are arranged on the drive carriage 9. In this configuration, the lower pressure plates 23, 23' in the closed position interact with the glide plates 24, 24' that can be moved on top of them and this results in a positive as well as non-

positive connection of the two arms 22 and 29 of the machine frame 20.

The different configurations show flying or stationary shears for cutting to length strips or sheet metal which shears can be moved in and out of the rolling line or the rolling table while the strip 1 or the sheet metal is moved in the line x-x on the rolling table 2 in the rolling table direction or is standing still. Because the shears are moved in only directly before the cut, the rolling table remains open in the upward direction and can remain freely accessible after mounting of the shears. The shears can be serviced outside of the line and, in the case of a disruption, can be moved quickly out of the line.

List of Reference Numerals

1	strip/sheet metal
2, 2'	rolling table
3	shears
4, 4'	blade holder
5, 5'	holding element
6, 6'	holding element
7	clamping element
8	drive apparatus
8'	gear
9	drive carriage
10	drive
11	force means
12	synchronization gear
13, 13'	wheel flanges
14, 14'	guide rails
20	machine frame
21	coupling elements
22	upper frame arm
23, 23'	pressure plates
24, 24'	gliding plates
25, 25'	force means
26, 26'	gliding path
27, 27'	recess
28, 28'	coupling sockets
29	lower frame arm
30	force means
31	spindle drive
32, 32'	coupling rod
34	joint

35	pivot axis
36, 36'	force means
37, 37'	pressure plates
38, 38'	gliding plates
39, 39'	recesses
40, 40'	coupling sockets